

Attorney Docket: 044182-0307083
Client Reference:

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION of: STEVEN C. QUARRE Confirmation Number: 7284
Application No.: 10/728,197 Group Art Unit: 3744

Filed: December 3, 2003 Examiner: EARLY, Michael Jacoby

Title: THERMALLY EFFICIENT CCD CAMERA HOUSING

AFTER-FINAL AMENDMENT

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Amendment is filed within two months of the Final Office Action dated March 22, 2007. Please amend the above-identified application as follows:

IN THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Previously Presented) A method of cooling a charge-coupled device; said method comprising:
 - coupling said charge-coupled device to a cold side of a thermoelectric cooling device;
 - coupling a hot side of said thermoelectric cooling device to a transfer plate;
 - mounting said transfer plate to a thermal barrier, said thermal barrier defining a cavity thermally isolated from said transfer plate, said cavity being adapted to house said charge-coupled device; and
 - coupling said transfer plate to a heat sink.
2. (Original) The method of claim 1 further comprising interposing a spacer between said charge-coupled device and said cold side of said thermoelectric cooling device.
3. (Original) The method of claim 2 wherein said interposing comprises selectively dimensioning said spacer to maximize a surface area of contact between said charge-coupled device and said cold side of said thermoelectric cooling device.
4. (Original) The method of claim 2 wherein said interposing comprises selectively dimensioning said spacer to position said hot side of said thermoelectric cooling device in a predetermined location relative to said charge-coupled device.
5. (Original) The method of claim 1 further comprising selectively applying a conformal coating to at least one of said transfer plate, said thermal barrier, and an interface between said transfer plate and said thermal barrier.
6. (Original) The method of claim 5 wherein said selectively applying comprises providing an environmentally tight moisture barrier with said conformal coating.
7. (Original) The method of claim 1 further comprising cooling said hot side of said thermoelectric cooling device.
8. (Original) The method of claim 7 wherein said cooling comprises transferring heat generated by said thermoelectric cooling device from said charge-coupled device.

9. (Original) The method of claim 1 wherein said mounting comprises attaching said transfer plate to an epoxy laminate material.
10. (Original) The method of claim 1 wherein said mounting comprises isolating heat generated by said thermoelectric cooling device from said charge-coupled device.
11. (Previously Presented) An apparatus comprising:
 - a charge-coupled device mounted in a housing, said housing including a thermal barrier and a cavity for mounting said charge-coupled device;
 - a thermoelectric cooling device having a cold side and a hot side; said cold side coupled to said charge-coupled device;
 - a heat sink; and
 - a transfer plate coupling said hot side of said thermoelectric cooling device to said heat sink in a heat transfer relationship; said transfer plate mounted to said thermal barrier such that heat transfer between said thermoelectric cooling device and said housing is inhibited.
12. (Original) The apparatus of claim 11 further comprising a spacer interposed between said charge-coupled device and said cold side of said thermoelectric cooling device.
13. (Original) The apparatus of claim 12 wherein said spacer is selectively dimensioned to maximize a surface area of contact between said charge-coupled device and said cold side of said thermoelectric cooling device.
14. (Original) The apparatus of claim 12 wherein said spacer is selectively dimensioned to position said hot side of said thermoelectric cooling device in a predetermined location relative to said charge-coupled device.
15. (Original) The apparatus of claim 11 further comprising a conformal coating applied to at least one of said transfer plate, said thermal barrier, and an interface between said transfer plate and said thermal barrier.
16. (Original) The apparatus of claim 15 wherein said conformal coating provides an environmentally tight moisture barrier.
17. (Original) The apparatus of claim 11 wherein said thermoelectric cooling device is a Peltier cooling device.

18. (Original) The apparatus of claim 11 wherein said transfer plate is constructed of a heat-conducting metal.
19. (Original) The apparatus of claim 11 wherein said thermal barrier is constructed of an epoxy laminate material.
20. (Original) The apparatus of claim 12 wherein said spacer is constructed of a heat-conducting metal.
21. **(Currently Amended)** A method of cooling a charge-coupled device, said method comprising:
- providing a cavity in a housing, said cavity adapted to house said charge-coupled device;
 - coupling said charge-coupled device to a cold side of a thermoelectric cooling device;
 - coupling a hot side of said thermoelectric cooling device to a transfer plate; and
 - sealing said cavity, said sealing operable to provide a substantially environmentally-tight moisture barrier for said charged-coupled device; and
interposing a thermal barrier between said housing and said transfer plate wherein said interposing comprises isolating heat generated by said thermoelectric cooling device from said charged-coupled device.
22. (Previously Presented) The method of claim 21 further comprising interposing a spacer between said charge-coupled device and said cold side of said thermoelectric cooling device.
23. (Previously Presented) The method of claim 22 wherein said interposing spacer between said charge-coupled device and said cold side of said thermoelectric cooling device comprises selectively dimensioning said spacer to maximize a surface area of contact between said charge-coupled device and said cold side of said thermoelectric cooling device.
24. (Previously Presented) The method of claim 22 wherein said interposing spacer between said charge-coupled device and said cold side of said thermoelectric cooling device comprises selectively dimensioning said spacer to position said hot side of said thermoelectric cooling device in a predetermined location relative to said charge-coupled device.
25. (Previously Presented) The method of claim 21 further comprising cooling said hot side of said thermoelectric cooling device.

26. (Previously Presented) The method of claim 25 wherein said cooling comprises transferring heat generated by said thermoelectric cooling device from said charge-coupled device.
27. (Previously Presented) The method of claim 21 wherein said sealing comprises applying a conformal coating.
28. (Previously Presented) The method of claim 21 wherein said sealing is operable to prevent moisture from penetrating said cavity.
29. **(Canceled)**
30. **(Currently Amended)** The method of ~~claim 29~~ claim 21 wherein said thermal barrier is constructed of an epoxy laminate material.
31. **(Canceled)**
32. (Previously Presented) An apparatus comprising:
a housing having a cavity defined therein, said cavity operative to mount a charge-coupled device;
a thermoelectric cooling device having a cold side and a hot side, said cold side coupled to said charge-coupled device;
a heat sink;
a transfer plate coupling said hot side of said thermoelectric cooling device to said heat sink in a heat transfer relationship; and
a conformal coating, said conformal coating operable to provide a substantially environmentally tight barrier for said charge-coupled device and to inhibit penetration of said cavity by moisture.
33. (Previously Presented) The apparatus of claim 32 further comprising a spacer interposed between said charge-coupled device and said cold side of said thermoelectric cooling device.
34. (Previously Presented) The apparatus of claim 33 wherein said spacer is selectively dimensioned to maximize a surface area of contact between said charge-coupled device and said cold side of said thermoelectric cooling device.

35. (Previously Presented) The apparatus of claim 33 wherein said spacer is selectively dimensioned to position said hot side of said thermoelectric cooling device in a predetermined location relative to said charge-coupled device.
36. (Previously Presented) The apparatus of claim 32 wherein said thermoelectric cooling device is a Peltier cooling device.
37. (Previously Presented) The apparatus of claim 32 wherein said transfer plate is constructed of a heat-conducting metal.
38. (Canceled)
39. (Previously Presented) The apparatus of claim 32 further comprising a thermal barrier interposed between said housing and said transfer plate.
40. (Previously Presented) The apparatus of claim 39 wherein said thermal barrier is constructed of an epoxy laminate material.
41. (Previously Presented) The apparatus of claim 39 wherein said thermal barrier is interposed such that heat generated by said thermoelectric cooling device is substantially isolated from said charged-coupled device.

REMARKS

Applicant thanks the Examiner for acknowledging that claims 1-20, 32-37 and 39-41 are allowable and for acknowledging the allowable subject matter in claim 31. Claims 21-30 stand rejected in the Office Action. Previously submitted claim 31 depended from claim 29 which depended from claim 21. Applicant has amended independent claim 21 to include all the elements of claim 29 and claim 31 and has canceled claims 29 and 31. Claim 30 is amended to change its antecedent from canceled claim 29 to amended claim 21. Applicant respectfully submits that amended claim 21 is allowable and that claims 22-28 and 30 are also allowable for at least the reasons that amended claim 21 is allowable.

Applicant has submitted the claim amendments to place the Application in condition for allowance. However, Applicant believes that claim 21 as previously presented is also allowable and fully intends to pursue the broader rejected claims in a continuation application.

All objections and rejections having been addressed, and in view of the foregoing, the claims are believed to be in form for allowance, and such action is hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, he is kindly requested to contact the undersigned at the telephone number listed below.

Please charge any fees associated with the submission of this paper to Deposit Account Number 033975. The Commissioner for Patents is also authorized to credit any over payments to the above-referenced Deposit Account.

Respectfully submitted,
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